

INTERMEDIATE – SECOND YEAR

MAY – 2017 I.P.E.PAPER (T.S)

MATHEMATICS – II (A) (E.M.)

Time : 3 Hours]

[Max. Marks : 75

Note : This question paper consists of three sections A, B and C.

SECTION – A

I. *Very Short Answer Type Questions :*

10 × 2 = 20

- i) Attempt **all** questions.
- ii) Each question carries **two** marks.

1. Find the complex conjugate of $(3 + 4i)(2 - 3i)$.
2. If the $\text{Arg } \bar{z}_1$ and $\text{Arg } z_2$ are $\frac{\pi}{5}$ and $\frac{\pi}{3}$ respectively, then find $\text{Arg } Z_1 + \text{Arg } Z_2$.
3. If 1, w , w^2 are the cube roots of unity, then prove that $\frac{1}{2+w} + \frac{1}{1+2w} = \frac{1}{1+w}$.
4. Find the value of m for the equation having equal roots $x^2 - 15 - m(2x - 8) = 0$.
5. If α , β , 1 are the roots of $x^3 - 2x^2 - 5x + 6 = 0$, then find α , β .
6. Find the number of terms in the expansion of $(2x + 3y + z)^7$.
7. Find the mean deviation about the mean for data 3, 6, 10, 4, 9, 10.
8. Find the number of injection of set A with 5 elements to a set B with 7 elements.
9. If ${}^9C_3 + {}^9C_5 = {}^{10}C_r$ then find r .
10. If the mean and variance of a binomial variable x are 2.4 and 1.44 respectively, then find n .

SECTION – B

II. *Short Answer Type Questions :*

5 × 4 = 20

- i) Attempt **any five** questions.
- ii) Each question carries **four** marks.

11. Show that the four points in the Argand plane represented by the complex numbers $2 + i$, $4 + 3i$, $2 + 5i$, $3i$ are the vertices of a square.
12. Determine the range of the expression $\frac{x^2 + x + 1}{x^2 - x + 1}$.
13. Resolve $\frac{3x^3 - 2x^2 - 1}{x^4 + x^2 + 1}$ into partial fractions.

14. A, B, C are 3 newspapers from a city. 20% of the population read A, 16% read B, 14% read C, 8% both A and B, 5% both A and C, 4% both B and C and 2% all the three. Find the percentage of the population who read atleast one newspaper.
15. Define conditional probability. State and prove multiplication theorem of probability.
16. If the letters of the word PRISON are permuted in all possible ways and the words thus formed are arranged in dictionary order, find the rank of the word PRISON.
17. Simplify ${}^{34}C_5 + \sum_{r=0}^4 ({}^{38-r}C_4)$.

SECTION – C

III. Long Answer Type Questions :

5 × 7 = 35

- i) Attempt **any five** questions.
- ii) Each question carries **seven** marks.
18. If n is a positive integer show that $(1+i)^n + (1-i)^n = 2^{\frac{n+2}{2}} \cos\left(\frac{n\pi}{4}\right)$.
19. Solve the equation $2x^5 + x^4 - 12x^3 - 12x^2 + x + 2 = 0$.
20. If the coefficients of 4 consecutive terms in the expansion of $(1+x)^n$ are a_1, a_2, a_3, a_4 respectively

then show that $\frac{a_1}{a_1 + a_2} + \frac{a_3}{a_3 + a_4} = \frac{2a_2}{a_2 + a_3}$.

21. Find the sum of the infinite series $1 - \frac{4}{5} + \frac{4 \cdot 7}{5 \cdot 10} - \frac{4 \cdot 7 \cdot 10}{5 \cdot 10 \cdot 15} + \dots$
22. Find the mean deviation from the mean of the following data, using the step deviation method :

Marks	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60	60 – 70
No. of Students	6	5	8	15	7	6	3

23. Three boxes B_1, B_2 and B_3 contain balls with different colours as shown below :

	White	Black	Red
B_1	2	1	2
B_2	3	2	4
B_3	4	3	2

A die is thrown. B_1 is chosen if either 1 or 2 turns up. B_2 is chosen if 3 or 4 turns up and B_3 is chosen if 5 or 6 turns up. Having chosen a box in this way, a ball is chosen at random from this box, if the ball drawn is found to be red, find the probability that it is drawn from box B_2 .

24. The range of a random variable X is $\{0, 1, 2\}$. Given that $P(X=0) = 3C^3, P(X=1) = 4C - 10C^2, P(X=2) = 5C - 1$.
- i) Find the value of C .
- ii) $P(X < 1), P(1 < X \leq 2)$ and $P(0 < X \leq 3)$